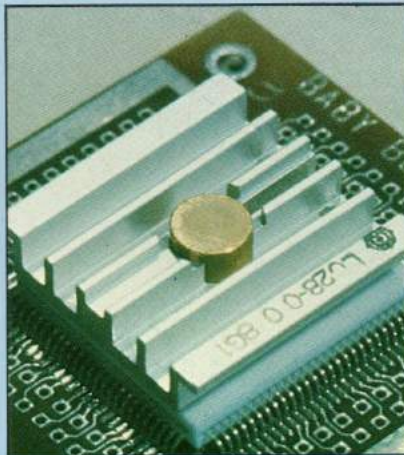


Advanced System/9000

Product Overview

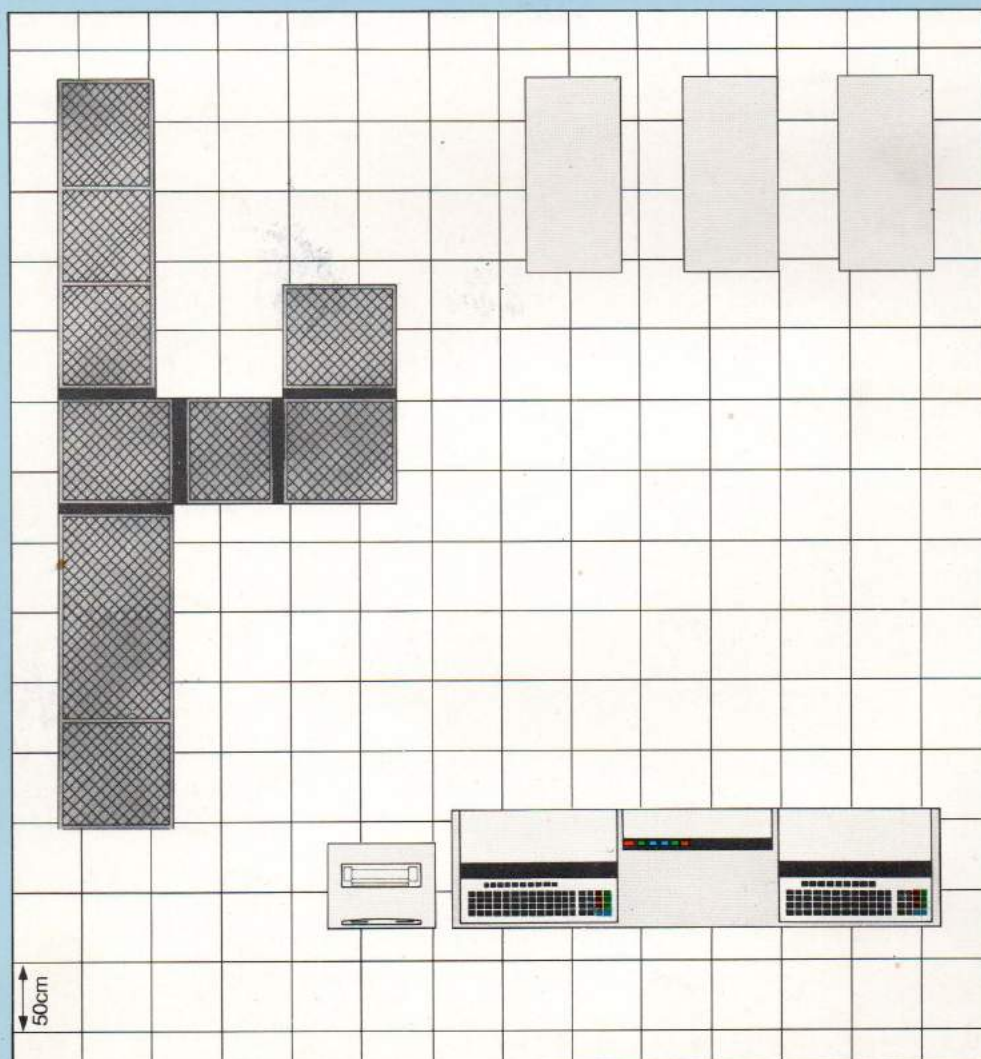
The Advanced System/9000 is a highly advanced uniprocessor complex that generally provides between 1.8 and 2.2 times the processing power of the IBM 3033. Utilizing the latest developments in semiconductor technology and a modular architecture, the AS/9000 retains full compatibility with IBM operating systems and peripheral devices, with full support for IBM System Products being provided by the extensive use of microprogramming. Future compatibility is also ensured by the incorporation of advanced architectural features. The complex is highly energy-efficient, air-cooled and offers new standards of reliability and availability, which, when coupled with its high level of performance make the AS/9000 a unique solution to the needs of the large-scale computer user.



Highlights

The AS/9000 processor offers:

- Full compatibility with IBM 370/303X software and peripherals
- Up to 16 channels driven by three I/O processors
- Data Streaming
- Up to 16 megabytes of main memory in two megabyte increments
- Dual service processors with four-colour video consoles
- Microcode assistance for MVS and VM
- Support for MVS/SP and VM/SP
- Advanced Large Scale Integration circuitry



Modular Architecture

The AS/9000 processor complex comprises six functional processors, each individually microprogrammed to ensure continuing compatibility with IBM system architecture.

The central processing unit contains 16 kilowords of 160 bit Reloadable Control Storage (RCS). This not only controls the basic operation of the machine, but provides specific assistance for MVS and VM via the related IBM System Product or System Extension offering. The central processing unit incorporates a pipelining technique whereby the two Instruction Units may each be preprocessing up to four instructions simultaneously with instruction execution. A cache memory, or High Speed Buffer, with a capacity of 64K bytes, is used to reduce main storage access by both the Instruction and Execution units. The execution of fixed and floating point multiplication and division

operations is performed by a High Speed Arithmetic sub-processor.

Support for Virtual Storage operations is enhanced by the provision of a 512 entry Translation Lookaside Buffer (TLB) and a 512 entry Segment Table Origin (STO) Stack.

Expandable Memory

Eight megabytes of Main Memory are provided with the standard system configuration. Additional memory may be added in two megabyte increments, to the current system maximum of 16 megabytes. Main storage sizes in excess of 16 megabytes may be addressed when supported by the relevant IBM operating system. Main Memory is eight-way interleaved and may be reconfigured in two megabyte increments.

Input/Output Operations

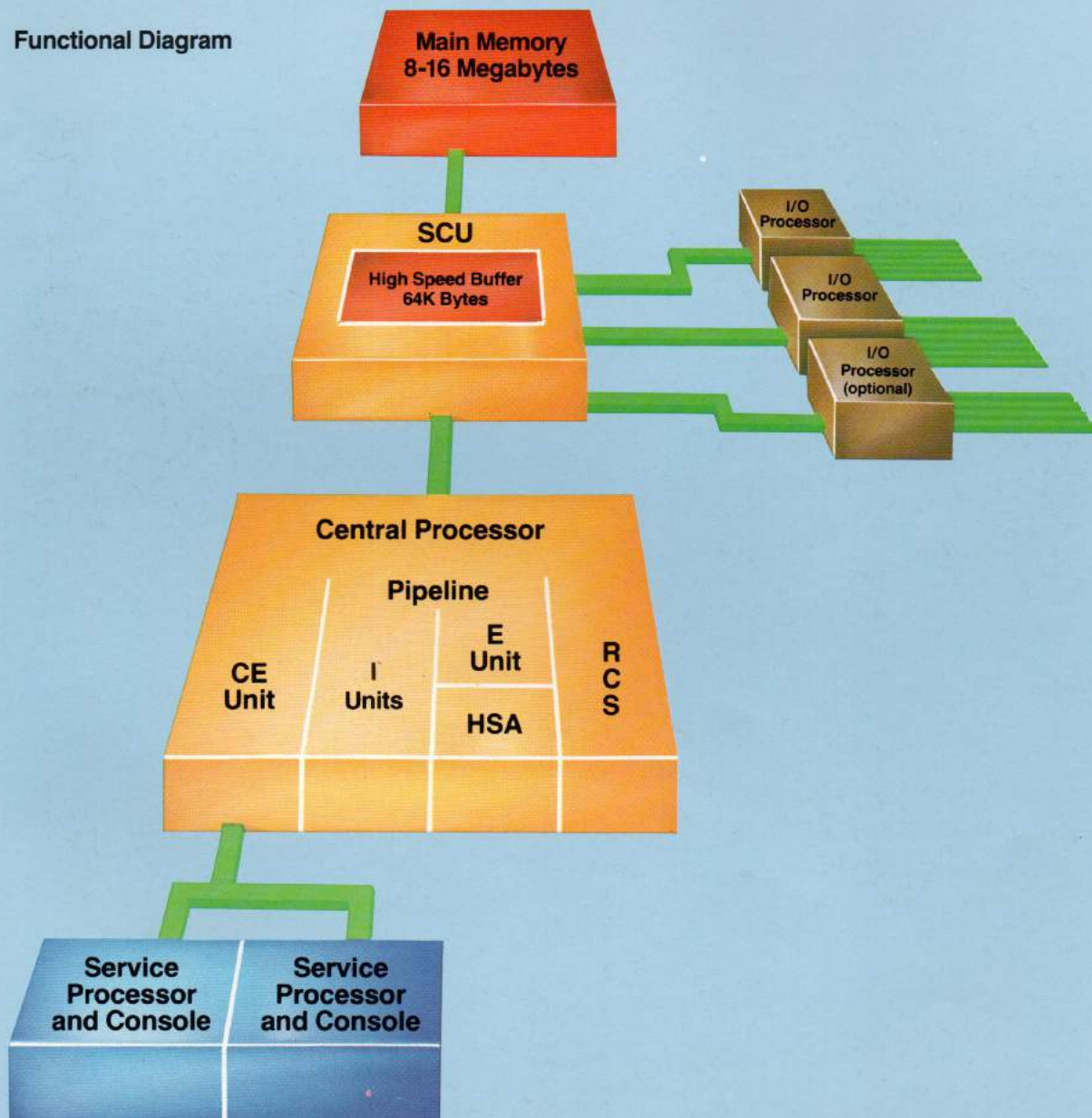
Independently microprogrammed Input/Output Processors (IOPs) are used to control I/O operations. Two IOPs are provided in the standard configuration, and

control 12 channels. The current maximum of 16 channels may be attained by the provision of an additional IOP.

Each channel is provided with 256 Unit Control Words (UCWs). One or two of the channels may be configured as byte multiplexor, the remaining being block multiplexor. An optional feature to support the IBM 3380 disk subsystem in Data Streaming mode will be provided. Channel-to-Channel-Adapters and Two-byte interfaces are also available.

The operation of the AS/9000 is controlled by two independent service processors. Each is provided with a 20 inch four-colour visual display unit, and a full-function keyboard. Two 120 cps Console Matrix Printers are available as options. Each may be used independently for operator control or Field Engineering diagnostic purposes, thus greatly enhancing the availability of the total system.

Functional Diagram



Environmental Considerations

The AS/9000 utilizes highly advanced Large Scale Integration, which permits the placement of up to 550 logic circuits on a single chip, and fast 16K bit memory components. This results in a system that outperforms the IBM 3033 Multiprocessor complex while being physically smaller than the 3033 Uniprocessor, consuming less electricity and generating less heat. The AS/9000 is also completely air cooled and provided with its own power distribution units, thus avoiding the need for water chilling apparatus or motor/generator equipment.

Thus not only are installation costs largely eliminated, but the remaining operational costs of the computer centre are significantly reduced.

Reliability

The exceptional performance of the AS/9000 is matched by its exceptional reliability. Each individual component and spare part is tested, and all semiconductor devices are aged by subjecting them to a prolonged cycle of operation at extremes of high and low temperatures. Complete sub-assemblies are tested and aged, and following final assembly the entire system is subjected to further prolonged testing. Thus by the time the machine is delivered, marginal components have been totally eliminated and the problems normally associated with the first six months of installation have already been resolved. Long term reliability is ensured by the high quality of the components and the extensive use of Computer Aided Design and Computer Aided Manufacture. These techniques ensure an efficient and serviceable design and consistent error-free implementation.

Full Reliability, Availability and Serviceability capabilities associated with large

scale processors are provided. Additionally, a diagnostic monitor is incorporated into the system to speed the diagnosis and rectification of faults. The error logging facility supported by the Operating System is supplemented by an additional 8-9 kilobytes of information. This is written to diskettes in the service processor following each machine or channel malfunction, and can be recalled and analysed by the Field Engineer independently of normal system operations.

Compatibility

The AS/9000 runs the IBM VM, MVS and VS/1 operating systems, and their associated Extensions and System Products without modification. Any program that operates on an IBM 3033 and is not subject to timing dependancies will also operate on the AS/9000.

Any I/O subsystem or device that will attach to an IBM 3033 and is supported by one of the operating systems mentioned above will also attach to the AS/9000.



Advanced System/9000

Advanced Systems Specification

Processor

AS/9000

Cycle Time	40 nanoseconds
High Speed Arithmetic	20 nanoseconds
Cache Memory	64 kilobytes
TLB Size	512
STO Stack Entry	512
Reloadable Control Storage	Up to 16K words (160 bit/word)
Extended Addressing Capability (Optional)	Up to 32 megabytes

Memory

Standard	8 megabytes
Maximum	16 megabytes
Increment	2 megabytes
Access Width	32 bytes
Error Correction	Single bit
Error Detection	Double bit
Interleave	8-way

Channels

Standard	2 byte +10 block multiplexors
Optional	1 byte +11 block multiplexors
Increment	4 block multiplexors
Maximum	16 channels
Nominal Data Transfer Rate	
Byte Multiplexor	100 kb/sec
Block Multiplexor	1.9 mb/sec
Data Streaming (Optional)	3 mb/sec
Maximum Aggregate Data Rate	24 mb/sec

Input/Output Features

Service Processors	2
Colour Consoles	2
120 cps Matrix Printer	2 (Optional)
Input/Output Processor	2
With additional Channels	3
Channel to Channel Adaptors	up to 3
Power Distribution Units	2
With additional Channels	3

Processor Features

Direct Control	Optional
High Speed Arithmetic	Standard
System 370/Extended Facility	Standard
Virtual Machine Assist	Standard

Physical Characteristics*

Floor Space	10.5 m ²
Heat Dissipation	34,000 kcal/hr
Power	52.2 kva
Weight	6100 kg

*Standard Configuration